

Green Computing Initiative For Optimizing Energy For Effective Computing

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Abstract: From home computers to enterprise systems, client to server machines, during recent years. It deals with reduction in carbon footprints and power saving. Energy is wasted in abundance at various data centres and data servers as well as in clouds. The research in the field of green computing is much wider. In the paper a detailed study has been done on various matters of green computing in all areas of society. Surveys have been analysed about green computing initiatives across the globe and interesting facts came out. Current trends, challenges and future trends in green computing are explored. Detailed research is required to find Green ICT so that users from different professions get benefits. In today's scenario global warming is becoming a great threat, so with a view to that it is the need of the hour to make people aware about Green Computing.

Keywords: *Green ICT Client and Server Machines, Carbon footprints, Green computing, IT, Computing, EnergyOptimization*

1. Introduction

Green Computing tends to responsible use of computers and other technologies like networking devices, printers, monitors and similar devices. It is the study of manufacturing, designing and disposing of computing devices in such a way so that they don't have negative impact on the nature. Reducing power wastage, developing efficient computing devices, reducing irresponsible use of devices, motivating recycling of devices and papers are all parts of green computing technologies. One of the reasons for Global warming is human activities and the recognition of these activities is increasing. Green Computing practices tackle the environment issues that have been there because of computing devices. Environmental sustainability can only be achieved with these practices only. The burning of fossil fuels produces power which is required to run a device. In office environments monitors have the highest energy consumption. The electricity costs can be reduced significantly by managing the usage of these devices. When a computer is active, on an average it requires between 36W and 250W. E-waste is becoming the rapidly-growing type of waste. Most electronics contain non-biodegradable materials. These types of materials can harm human life badly. Lead, mercury and toxic materials are found in most electronics. According to StEP, 48.9 million metric tons of e-waste was generated in 2012 worldwide. This can cause serious environmental problems that should be tackled properly.

2. Implementation of Green Computing

It is a necessity to find out the solution for the above mentioned problems due to e-waste. It becomes the responsibility of every individual and institution to take proper care for reducing the negative impacts of this problem. Green Computing is the best way to overcome this problem. Following are some ways how green computing should be implemented:

2.1 Computer Devices: There are different kinds of monitors available in the market these days. LCD monitors consumes less energy as compared to CRT monitors. Laptops require a fraction of the energy as compared to desktop computers because of the following reasons :

- (i) Laptops are more frequently turned off and unplugged.
- (ii) They require less power.
- (iii) To preserve battery power.

2.2 Computer Ethics: As technology advances, computers are having a greater impact on society. People should be aware about ethics of computer. They should learn the facts to be followed while using computer. These are :

- (i) One should turn off the computer when not in use.
- (ii) Put the computer on sleep mode if nobody is using it.
- (iii) Always use good power supply units.
- (iv) Avoid using Screen Savers rather than turn off the monitor.

2.3 Cloud Computing: Cloud computing is when a device is allowed to be shared across the network by a lot of other devices so that the same hardware device can be used by all the devices connected to the cloud. It has the ability to remove the carbon footprint because one device is shared across the network.

2.4 Desktop Virtualization: In Desktop Virtualization, server hosts many other servers. It reduces the carbon footprint because of the usage of multiple computer devices. Hosting multiple servers on small number of servers is a far better approach which reduces the power consumption to a great extent. Virtualization makes better hardware usage and reduces demands for energy.

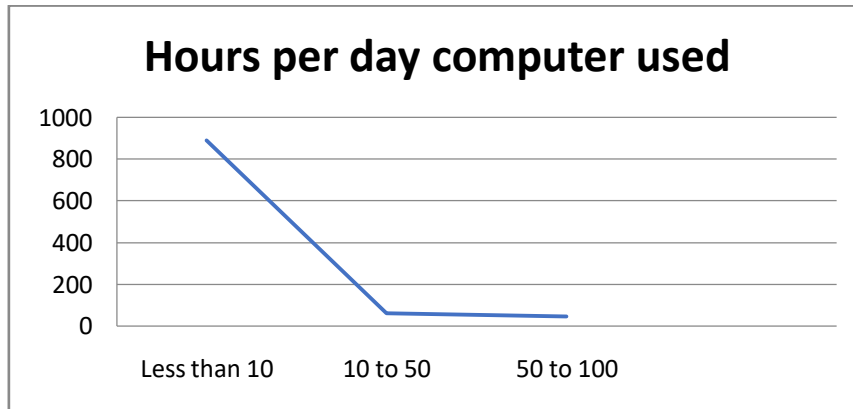
2.5 Telecommunication: There are many services available in telecommunication through which green computing can be implemented such as teleconference and telepresence. Culture of working from home is increasing these days which reduces travelling resulting in the reduction of greenhouse gas emissions. It also reduces heat, lighting and lower costs for office.

2.6 E-Waste Cycling: There should be a trend of recycling of E-wastes like old computers and monitors. Rather than disposing them, one must try to recycle these wastes. There are municipal and private recycling bodies available one should submit these waste material with these organisations. Refurbishing is also a great thing in terms of managing e-waste. In that, the devices are used and after damage they are repaired so that they can be used again.

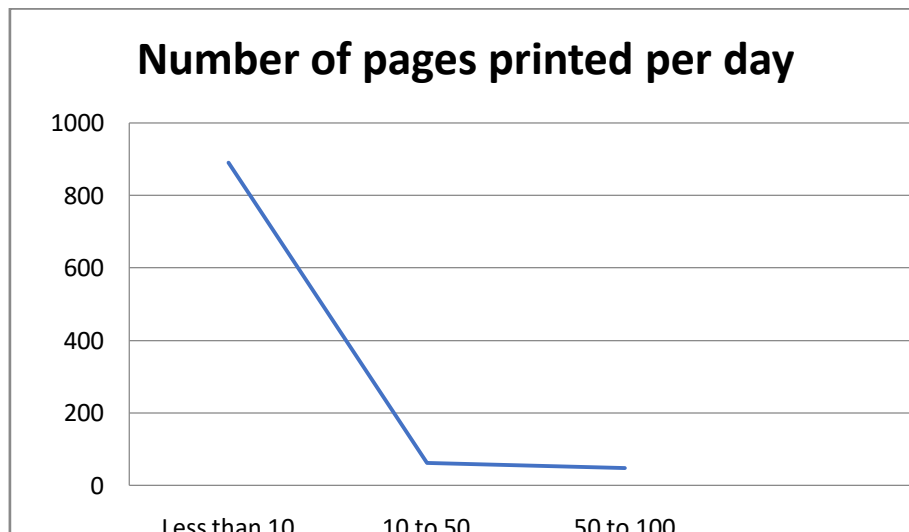
2.7 Power Management: Power management can be done by ensuring that Computers systems are turn off when there is no need of these devices. Laptops should be put on sleep mode in idle times. There must be provisions in software too of less power consumption. There must be built in power saving features. Energy Consumption can be analysed by Energy star labels. Appliances having high star rating should be purchased.

3. Results and Discussions

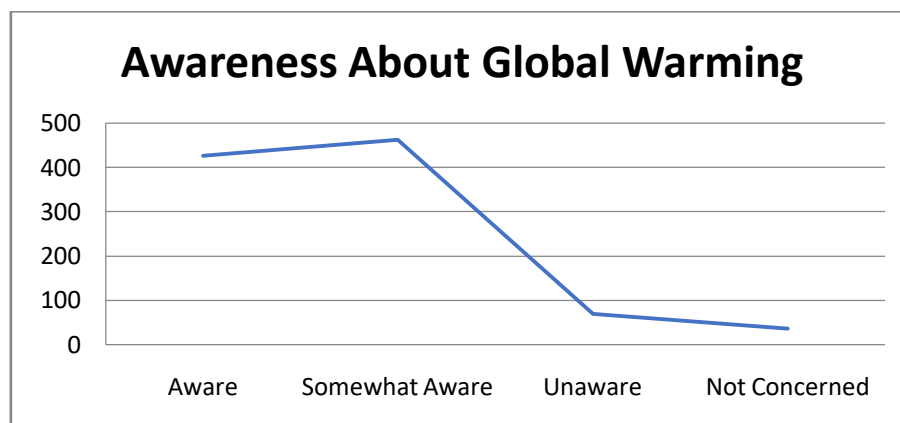
Various surveys have been conducted and many results came about the daily usage of computers, hours per day computer used, number of computers/laptops owned, Number of pages printed per day, number of people switching to low power consumption mode, awareness about risk to environment due to global warming. A few of them have been elaborated below:



Out of 1000 persons , about 150 persons uses computer for less than 1 hour per day ,around 660 persons uses computer for 1 to 5 hours per day ,about 155 uses 5 to 10 hours per day and about 41 persons for more than 10 hours. As it is seen that about 660 persons out of 1000 are using computer for 1 to 5 hours which is the maximum should be made aware about the right usage of computer. They must be aware about the power saving approaches so that they can make best use of computer and utilize it maximum. The reduction in consumption of electricity would definitely reduce the energy usage to a great extent.



It is seen that around 89% of the users print an average of less than 10 pages per day. Around 6% prints between 10 to 50 pages and around 5% between 50 to 100 pages. So there must be provisions for ink utilizations. Certain methods must be used so that there be maximum utilization of ink used to print a page, so that no. of cartridges used are less which lead to reduction in e-waste as well.



Out of 1000 people about 427 which is 43% are aware about the present issues related with global warming. There are so many issues concerned like carbon in air, climate variation etc.. Around 7% are unaware about these issued and around 4% are not even concerned. So there is lack of awareness. If awareness will be there, we can think of the change. These were the results of the surveys done on literate people. The results can be down if it is to be done on common masses. So it is mandatory to make people aware about the present scenario and the future results. We need to do improvements in our daily habits regarding usage of technology and power consumption.

4. References

- [1]S.Agarwal, A.Vimal, S.Ghosh, A.Nath,Green Computing Endeavor in Higher Educational Institutes – a noble initiative towards Sustainable IT Infrastructure, Journal of Computing(USA), Vol 4 ,issues 5, May, ISSN-9617, Page-217-222,2012
- [2]S.Agarwal, A.Vimal, S.Ghosh, A.Nath,Green Green Computing and Green Technology based teaching learning and administration in Higher Education InstitutionsInternational Journal of Computer Applications(IJCA), Vol 76, No. 7,(August),Pp. 35-41(2013)
- [3]Sivaharan, T, Blair, G. and Coulson, G (2005), GREEN: A Configurable and Re-configurable Publish-Subscribe Middleware for Pervasive Computing - lecture Notes in Computer Science, 2005 – Springer
- [4]SuryawanshiKavita and Narkhede S., Green ICT at Higher Education Institution: Solution for Sustenance of ICT In Future, International Journal of Computer Applications (IJCA), ISSN: 0975 – 8887, Volume 107, No. 14, 2014, DOI: 10.5120/18823-0237, pp 35-38.
- [5]Yasuyuki Sugiyama,2011, “ Green ICT toward Low Carbon Society”, Proceedings of Eco Design 2011: 7th International Symposium on Environmentally Conscious Design and Inverse Manufacturing, Springer Netherlands publisher, DOI 10.1007/978-94-007-3010-6_149, pp 739-742.
- [6]S. Sterling, "Higher education, sustainability, and the role of systemic learning", in Higher education and the challenge of sustainability: Problematics, Promise and Practice, P. B. Corcoran and A. E. J. Wals, Editors. 2004, Springer: Netherlands. p. 49-70
- [7]Mark C. Sheehan , Shannon D. smith, Powering down: green IT in higher education, research study, EDUCAUSE center for Applied research, Washington, April 2010